

Case Report

A degloving foot injury in a traffic accident

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Abstract

An unusual human remain found on a road became one key to reconstruct the traffic accident. A woman was found dead on a snow-covered road. Her left foot showed a large deficit of skin and underlying fat tissue. The detached skin and tissue were found into her left sock and shoe lying at a distance of 23 m from the body. There were multiple fractures on her back and occipital cranial bone. Severe injuries revealed in heart, liver, and brain. The neck remained intact. These findings suggested that her back has been strongly hit by the object with the flat surface, for example, the front side of a cab-over or truck, from behind at a high speed. Furthermore, the degloving injury in her left foot suggested that a vehicle ran over the foot which faced the vehicle. We reconstructed the accident as follows. Firstly the wheel of the vehicle ran over the victim's foot, and then, the victim turned away from the vehicle. Finally, the front side hit her twisted body from behind, resulting in a traumatic degloving injury.

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1. Introduction

Accident reconstruction from injury findings is important in forensic autopsies, especially in cases of traffic accidents.^{1–3} This reconstruction requires not only the cause of death but also mechanisms how victims got each injury. In vehicular accidents involving pedestrians, one of questions that will be raised is the position of the pedestrian. Patterns of injuries often depend on the pedestrian position, such as walking, standing or lying on the road. Moreover, the direction of impact and vehicle identification can be also deduced by injury findings. In the present study, we observed an unusual avulsed skin of the foot which is inconsistent with the injuries found in the body-part, and interpreted this degloving injury to reconstruct the accident.

2. Case report

One winter morning, a 53-year-old woman was found dead on a snow-covered road. She lied face down with her body in a twisted position – her legs were spread similar to running style. There were shattered vehicle fragments near the woman's body. A large deficit of skin and underlying fat tissue were observed on her left foot. The detached skin and tissue of the left foot were in her left sock and shoe lying on the road at a distance of 23 m from the body. The next day, a forensic autopsy was performed.

3. Autopsy findings

The victim was 159.5 cm in height and weighed 59.2 kg. Subcutaneous and intramuscular bleeding was observed on the broad of her back, predominantly on the left side. There was no decollement in the body. There were multiple fractures of the ribs and pelvis as well as fractures of the third and fourth lumbar vertebrae. Excoriation and subcu-

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taneous bleeding were observed on the face, chest, and extremities. The cardiac sac was ruptured such that the heart was exposed. The apex of the heart and the interior vena cava were ruptured. The liver was completely torn in two down the middle, and the lower lobe of the right lung, spleen, and left diaphragm were also injured. A crush fracture of the cranial bone and severe brain damage in the occipital region were also observed. Therefore, the direct cause of death was diagnosed as heart injuries.

A large deficit of skin and underlying fat tissue was observed on the left foot. The peripheral skin was rough-edged and avulsed with a 5×2 cm cavity on the sole of her left foot, suggesting a decollement injury. The toes on her left foot were fractured; however, there was neither tendon injury nor fracture of the left ankle or left knee. The detached skin and fat tissue were found in her left sock and shoe. These were found lying on the road at a distance of 23 m from the body (Fig. 1). A kind of tire tread pattern was imprinted over the avulsed skin of the dorsum of the foot. All nails were attached to the avulsed skin. The skin appeared to have peeled off similar to a sock.

4. Discussion

In the present case, there was no sign of decollement (skin detachment), which is one of the classic run-over findings,^{1–5} on the victim's body-part, suggesting that her body-part was not run-over. Occipital region of cranial bone, vertebrae, pelvis, and ribs were fractured with organ damage. Moreover, severe injuries such as intramuscular bleeding and fractures^{5–8} were all localized along her backside, and there were only excoriation and subcutaneous bleeding on the front side of the body. Therefore, the strong force, such as a vehicle, appeared to have impacted from her backside. A car often scoops up the pedestrian after impacting the lumbar or legs, and the victim will land on either bonnet or against the wind screen or corner of supporting pillar, causing head injuries.² However, the scooping-up would cause not only cranial bone fracture but also fractures or dislocations of cervical vertebrae as a result of hyperextension of the neck. In the present case, there was no injury at her neck, suggesting that the victim was impacted at the head and body simultaneously by the

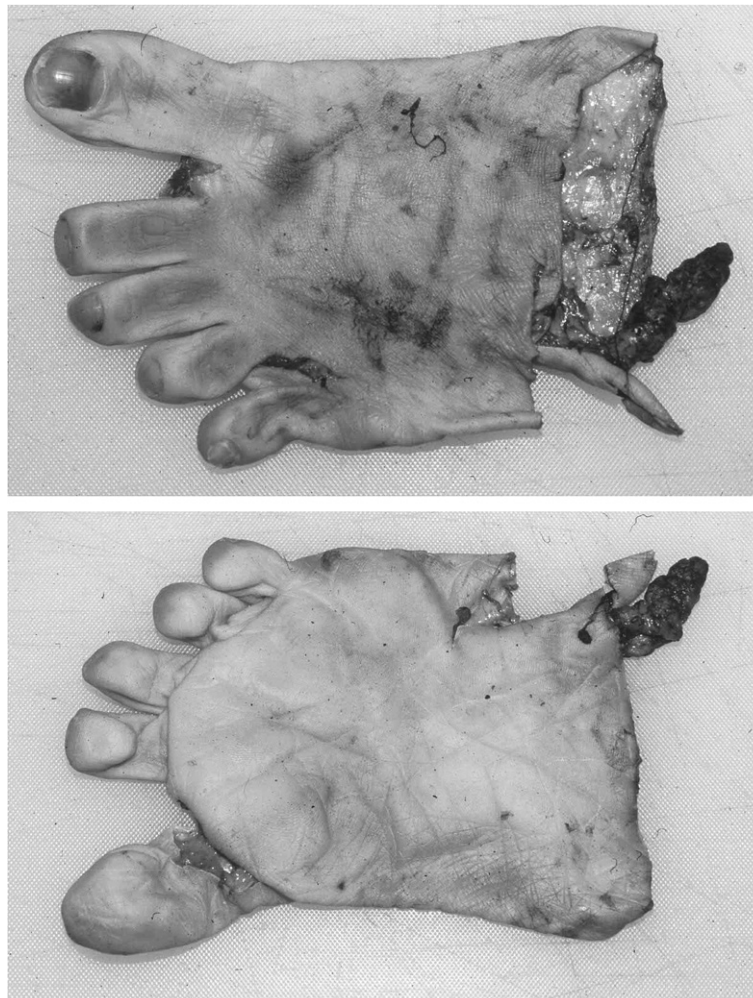


Fig. 1. The skin and fat tissue found in the victim's left sock and shoe; these were found lying on the road at a distance of 23 m from the body (dorsal and lower sides).

flat surface of a vehicle, such as the front side of a cab-over or truck, rather than was scooped up by a car. If the body is thrown forward by the impact, the pedestrian may experience secondary injuries when striking the ground, and this secondary impact occasionally induces severe injuries.² In this case, the secondary impact was not considered to be strong because there were no severe injuries on the front side of the body, although the victim lied face down. The snow on the road might have played a role in reducing the force of secondary impact.

The detachment of the skin and fat from the muscle of the left foot was similar to decollement, and a kind of tire tread pattern was imprinted on the skin of her left foot. Both these observations are classic signs of a run-over accident.^{4,5} However, we could not sort out the mechanism that the skin of the victim's left foot appeared to have peeled off similar to a sock with the explanation of simple run-over on the foot. One possible explanation is that the body was pushed forward with considerable force while her foot was trapped between the wheel and ground. Vehicle-pedestrian accidents often injured ankle joints, usually as a result of inverse injuries induced by high impact.⁹ The onset of ankle joint injuries is a dislocation of the crus (supporting the body weight) in relation to the foot, loaded and stabilized on the ground by friction force.⁹ In the present case, there was no fracture in left ankle joint of the victim even though her left foot was considered to be stabilized by the wheel when the vehicle hit her body. Therefore, the detachment of the skin rapidly released her foot from the stabilization.

On experiencing an impact with the vehicle, the left foot may have been facing the vehicle. Subsequently, it was flayed by the rotating wheel. However, the autopsy findings suggest that the left foot was in a counter direction to the body. Although the woman was probably hit by the vehicle from behind, her left foot appeared to have been facing the vehicle and subsequently flayed by the wheel. We verified this discrepancy as follows. The victim is believed to have been facing the vehicle, turning away at the moment of impact. The twisted position on the road explains the discrepancy in the directions of her body and the left foot.

First, her left foot may have been stabilized on the ground by the wheel. Subsequently, she turned away and her twisted body was hit from behind of her body by the vehicle, causing the skin of her left foot to peel off similar to a sock.

In conclusion, we reconstructed the accident from the injuries and the human remains in a case. Firstly, the wheel of an vehicle ran over the victim's foot. After that, the victim turned away from the vehicle, and the front side of the vehicle hit her twisted body from behind. We showed that careful observation of human remains is conducive to reconstruct the mechanism of accident more accurately.

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